



## Visualization, Modeling and Simulation Instrumentation



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<p><b>13. ABSTRACT (Maximum 200 Words)</b></p> <p>Scientific visualization stimulates human visual perception to capture patterns within complex data so that scientific inferences can be reached. Interactive visualization tools, coupled with immersive Virtual Reality (VR) technology can stimulate student's investigative learning of science with a high degree of realism. The goal of this project is to provide much needed visualization, and modeling facilities to attract, and train MSET (Mathematics, Science, Engineering and Technology) undergraduates to meet the scientific and technological challenges of the new millennium.</p> <p>The list of requested instrument proposed includes: ImmersaDesk (with CAVE Library, WorldToolKit and WorldUp Lab License, WTK Immerse Display Option for ImmersaDesk) to be attached to the Onyx2 InfiniteReality 2 system; EON Studio and Immersive Reality System (with EON Immerse software); and SensAble Phantom Desktop (with SensAble FreeForm for modeling and SensAble Ghost SDK) for instructions and faculty and faculty-directed research, and enhancing computer graphics and scientific visualization courses.</p> <p>The following objectives were met: 1) Offer attractive state-of-the-art learning facilities to attract and train students for interdisciplinary study; 2) Enrich and initiate innovative science instruction, research activities, and NSU's science program offerings through the visualization and the modeling of scientific knowledge to support inquiry-based learning activities.</p>					
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**FINAL REPORT**

**ON**

**“VISUALIZATION, MODELING AND  
SIMULATION INSTRUMENTATION”**

**FOR THE PERIOD**

**SEPTEMBER 1, 2000 – AUGUST 31, 2001**

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## **INTRODUCTION**

Scientific visualization stimulates human visual perception to capture patterns within complex data so that scientific inferences can be reached. Interactive visualization tools, coupled with immersive Virtual Reality (VR) technology can stimulate student's investigative learning of science with a high degree of realism. The goal was to attract, and train Norfolk State University MSET (Mathematics, Science, Engineering and Technology) undergraduates with the use of visualization, simulation and modeling computing equipment to support innovative instructional and research activities thereby meeting the scientific and technological challenges of the new millennium.

The following proposed objectives to reach this goal were met:

- Offer attractive state-of-the-art learning facilities to attract and train students for interdisciplinary study, thereby increasing significantly the number of minority students receiving Bachelor of Science degrees to go to graduate school or technical employment.
- Enrich and initiate innovative science instruction, research activities, and NSU's science program offerings through the visualization and the modeling of scientific knowledge to support inquiry-based learning activities.

## **RESULTS**

We have completed the implementation of the proposed plan of acquiring and utilizing the equipment to the fullest.

- We acquire NSU matching fund for equipment: 1 SGI Onyx2, 2 Pentium workstations, and workshop expenses).
- Submitted one grant proposal to NIMA, based on the utilization of the acquired ImmersaDesk,
- Conducted 3 faculty workshops to enhance faculty's knowledge in VR sciences. The workshops were well received by scientists from Computer Science, Chemistry, Physics, and Mathematics. Faculty member are currently supervising senior student projects using the equipment.
- Strengthened the capability of the Computer Science Department and contributed to the recent approval of the Graduate Program in Computer Science at NSU.

## **PROJECT IMPLEMENTATION DETAILS**

The following table depicts the equipment purchased, NSU matching and the activities conducted using the equipment:

Equipment Acquired	NSU Matching	Activities
ImmersaDesk with CAVE Library, WorldToolKit and WorldUp Lab License, WTK Immerse Display Option for ImmersaDesk.	SGI Onyx2 InfiniteReality 2 system ; workshop expenses	1. Faculty ImmersaDesk and CAVELib Training on Mar 26-27, 2001: 10 computer science faculty members; Dr. Waldo Rodriguez (Chemist), Dr. Raj Chaudhury (Physicist), Dr. Guy Hogan (Mathematician)
	workshop expenses	2. Faculty vGeo Training on May 24, 2001: 8 computer science faculty; Dr. Waldo Rodriguez (Chemist), Dr. Raj Chaudhury (Physicist), Dr. Guy Hogan (Mathematician).
	workshop expenses	3. Faculty vGeo Offsite Training on May 24, 2001: Ms. May Hou, and Ms. Aurelia Williams (Computer Science); Dr. Waldo Rodriguez
		4. On March 7, 2001, PI, Dr. Mou-Liang Kung submitted a proposal to utilize the ImmersaDesk to NIMA titled "3D Immersive Visualization of Water Vapor Data over Earth Topography" (\$100,000, not funded)
EON Immersive Reality System (with EON Immerse software)	Pentium Workstation; Faculty release time for supervision	1. *Two teams of students currently are conducting their senior projects to create Web based 3D virtual models. The EON Studio which requires no coding proves to be a winner among the students and faculty.
	NSU provided facilities and lunches	2. Faculty EON Studio and EON Reality Workshop held on Nov 27 - 29: 8 faculty members and two students attend
SensAble Phantom Desktop (with SenAble FreeForm for modeling and SensAble Ghost SDK)	(ditto)	**One team of students currently is conducting their project of creating a virtual hand model to allow the Phantom force-feedback arm to act as an surgical instrument.
3D Studio Max Bundles	NSU Fund	They were not purchased under the sponsor's funding due to the fact that the Department had other resources to purchase. However, students working on the projects * and ** also utilize 3D Studio Max to build models imported into their applications
WorldToolKit and WorldUp license for visualization programming taught in the new scientific visualization course.		Originally, we plan to use the Toolkit in the new course Scientific Visualization. We used VTK instead, since the WorldToolkit requires a sharp learning curve for students. We had one student who used World ToolKit and has since graduated. There are no students who are interested in low level programming.